Psychiatry Research ▮ (▮▮▮▮) ▮▮▮–▮▮▮

Contents lists available at SciVerse ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

Decision-making and impulsivity in eating disorder patients

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ARTICLE INFO

Article history:
Received 3 February 2012
Received in revised form
3 October 2012
Accepted 7 October 2012

Keywords:
Iowa Gambling Task
Anorexia nervosa
Bulimia nervosa
Personality

ABSTRACT

Impairment in decision-making can be related to some pathological behaviors in eating disorders. This ability was assessed in 71 eating disorder patients (27 restricting type patients and 44 binge/purging type patients) and compared with 38 healthy controls using the Iowa Gambling Task. This task simulates real-life decision-making by assessing the ability to sacrifice immediate rewards in favor of long term gains. Furthermore, some studies have demonstrated a relationship between impulsivity and decision-making, so in our study the Barratt Impulsiveness Scale was also used. Eating disorder patients, both the restricting and the binge/purging groups, performed poorly in the Iowa Gambling Task compared to controls, confirming a deficit in decision-making in these patients. The restricting group showed poorer IGT performance than the binge/purging group. Interestingly, impulsivity was negatively correlated with decision-making, but only in the binge/purging group. In conclusion, our results confirm a specific deficit in eating disorder patients which may be related to their pathological eating behavior, and suggest that this impairment might be explained by different mechanisms in restricting and binge/purging disorders.

1. Introduction

Decision-making is defined as the capacity to make decisions about a course of action (Guillaume et al., 2010). Impairment in this cognitive function can be related to some pathological behaviors. The Iowa Gambling Task (IGT) (Bechara et al., 1994) is an experimental test which simulates real-life decision-making in situations that involve uncertainty, reward and punishment. Performance on this task has been shown to be sensitive to ventromedial prefrontal cortex (VMPFC) and limbic system functioning, so that patients with damage to VMPFC showed impaired performance on the IGT compared to control subjects (Bechara et al., 1999). Like patients with VMPFC lesions, some mental disorders have also shown impairment in the IGT, such as substance abuse and dependence (Grant et al., 2000; Bechara and Damasio, 2002; Dom et al., 2006; Verdejo-García et al., 2007), obsessive-compulsive disorder (Cavallaro et al., 2003; Lawrence et al., 2007), pathological gambling (Goudriaan et al., 2006; Linnet et al., 2006) and eating disorders (Cavedini et al., 2004, 2006; Tchanturia et al., 2007; Liao et al., 2009; Tchanturia et al., 2012). Patients with these disorders show an inability to make advantageous decisions and a preference for immediate reward in spite of future negative consequences.

With regard to eating disorders, some studies have found decision-making impairment in anorexia nervosa (AN) restricting and binge/purging types (Cavedini et al., 2004, 2006; Tchanturia et al., 2007, 2012), in AN restricting type (Abbate-Daga et al., 2011), in bulimia nervosa (BN) (Boeka and Lokken, 2006) and in both AN and BN (Liao et al., 2009; Brogan et al., 2010). To our knowledge, only Guillaume et al. (2010) and Bosanac et al. (2007) failed to confirm this deficit in samples of AN and BN patients, compared to controls. In Guillaume et al. (2010) patients were euthymic and free of medication, whereas in Bosanac et al. (2007) a very modest sample size was used, which may explain inconsistent results with other studies. Regarding differences in the IGT net score between patients and healthy controls, Tchanturia et al. (2012) reported medium to large effect sizes between AN patients and controls (Cohen's $d=0.64$ for males; Cohen's $d=0.72$ for females). From data reported in other studies, we found large effect sizes between AN and controls in Cavedini et al. (2006) (Cohen's $d=0.98$) and in Abbate-Daga et al. (2011) (Cohen's $d=1.0$). The effect sizes of the rest of the studies could not be calculated due to the absence of required data. Moreover, Cavedini et al. (2004, 2006) compared IGT performance between AN restricting type (AN-R) and AN binge-eating/purging type (AN-BP), reporting differences between them, with a significantly greater impairment in AN-R type. On the contrary, no other studies compare these groups, so no definite conclusions can be drawn with respect to restricting and binge/purging types. Another limitation of some of these studies is that a larger sample

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http://dx.doi.org/10.1016/j.psychres.2012.10.004

size would have been desirable. Thus, there is evidence that eating disorder patients have a decision-making deficit, but more data are needed to confirm possible differences in decision-making ability among eating disorder types.

Besides, there is recent research on personality traits underlying decision-making deficits. Of the different personality characteristics, impulsivity has been the most studied, as it involves acting without planning and without considering the consequences of that behavior, which might be associated with long-term losses. In fact, some studies showed a negative correlation between impulsivity and IGT performance in the general population (Zermatten et al., 2005; Davis et al., 2007). However, in eating disorder patients, Liao et al. (2009) found no correlation between impulsivity and IGT performance. Nor did they find this correlation in a sample of women with AN or in women with BN. Similarly, Tchanturia et al. (2012) did not find this association in a sample of men with AN. In these studies the authors do not specify the results separately in different eating disorder groups. It is known that AN and BN patients differ clearly in impulsivity, with higher levels in the latter (Cassin and von Ranson, 2005). Within AN patients, there are also significant differences in personality characteristics, with the AN-R type being related to perfectionism and rigidity, while impulsivity is more associated with the AN-BP type (Fassino et al., 2004). Thus, regarding personality traits, the AN-BP group is closer to the BN group than to the AN-R group (Fassino et al., 2004).

In short, there is some evidence that AN-R type shows poorer IGT performance than AN-BP type (Cavedini et al., 2004), and that both AN subtypes and BN show poorer IGT performance than healthy controls. As decision-making has been related to impulsivity in some studies, and as AN-BP subtype and BN patients show higher levels of impulsivity than AN-R patients, the present study was designed to examine decision-making using the IGT in AN-R patients (restricting group) on the one hand, and in AN-BP and BN patients (binge/purging group) on the other.

The second aim of this study was to explore whether there is a link between impulsivity and decision-making in both groups separately. The control group was needed just to compare the IGT performance of eating disorder patients with that of healthy controls. It is for this reason that the impulsivity measure was not administered to the control group. Considering the previous findings, we tested the following hypotheses: (a) eating disorder patients, both the restricting and the binge/purging group, will show a decision-making impairment in comparison to healthy controls; (b) the restricting group will show poorer IGT performance than the binge/purging group; and (c) impulsivity will be associated with poorer performance in the IGT in both groups. However, the second and third hypotheses have to be taken as preliminary, as previous studies are scarce and give inconsistent results.

2. Methods

2.1. Participants

Seventy-one patients admitted to our eating disorders unit at the Hospital Universitari Mútua Terrassa in Spain agreed to participate in the study. All of them fulfilled current Diagnostic and Statistical Manual-Fourth Edition (DSM-IV) (American Psychiatric Association, 1994) diagnostic criteria for AN or BN: 27 (38%) patients satisfied criteria for AN-R (restricting group), 20 (28.2%) patients for AN-BP, and 24 (33.8%) patients for BN purging type (so that the binge/purging group consisted of 44 patients). The entire eating disorders sample consisted of female participants, as eating disorders are much more prevalent in women. Patients with psychotic disorders, bipolar disorder or obsessive-compulsive disorder were excluded.

Thirty-eight healthy controls were also screened. All the participants in the control group were female and had no history of psychiatric disorder.

Exclusion criteria for the whole sample were brain injury or neurological disease and lifetime or current substance abuse or dependence. Written consent was obtained from each participant.

2.2. Measures and materials

2.2.1. Iowa Gambling Task (IGT)

The IGT (Bechara et al., 1994) simulates real-life decision-making by testing the ability to sacrifice immediate reward in favor of long-term gains. We used the computerized version of the task and facsimile money as reinforcers. The task involves making 100 selections from four decks of cards (A, B, C, and D). Each selection is always followed by the gain of money, but sometimes, and at unpredictable points, the selection of any card can also be followed by the loss of money. Decks A and B are disadvantageous: high rewards but higher future losses, leading to a negative net score. Decks C and D are advantageous: low rewards but lower future losses, leading to a positive net score. The aim of the task is to earn as much money as possible. Participants are free to switch from any deck to another at any time. The 100 selections are divided into five blocks of 20 consecutive selections to examine learning on the task. A net score is measured by calculating the number of cards picked from advantageous decks (C and D) minus the number of cards picked from the disadvantageous ones (A and B) in each block of 20 cards. Thus, positive net scores mean a preference for the advantageous decks and negative net scores mean a preference for the disadvantageous ones. A total net score for the 100 selections is also calculated. Control subjects usually show a preference for the advantageous decks, showing an improvement in performance over the five blocks of card selections. Specific instructions of the IGT have been described in detail elsewhere (Bechara et al., 1999). This task takes 10–15 min to complete.

2.2.2. Barratt Impulsiveness Scale (BIS)

The BIS scale (Patton et al., 1995), Spanish version (Oquendo et al., 2001), is a 30-item self-report questionnaire (4-point Likert type) which examines the level of impulsivity and provides three subscale scores: attentional, motor, and non-planning impulsiveness. Subscales are added to give a total score.

2.2.3. Beck Depression Inventory (BDI)

The BDI (Beck et al., 1961), Spanish version (Conde and Useros, 1975), is a widely used 21-item self-report scale, 4-point Likert type, which identifies different depressive symptoms and measures the severity of depression.

2.2.4. Semi-structured interview

Prepared ad-hoc, it was used to register socio-demographic and clinical variables.

2.3. Procedures

In the eating disorder group, eating disorder diagnoses were performed by a psychiatrist or a clinical psychologist, according to DSM-IV criteria. Assessment in this group consisted of two parts. In the first session, a short structured interview was administered to each patient in order to take socio-demographic and clinical data. Body Mass Index (BMI), expressed as kg/m^2, was also measured. Afterwards, the IGT was administered. In a second session, which took place on average 1 week after the first session, patients answered self-report questionnaires (BDI and BIS-11). Ethical approval was obtained from the hospital's Ethical Committee.

Control participants passed the IGT and answered a short structured interview about demographic variables in order to discard psychiatric disorders.

2.4. Statistical analyses

All statistical analyses were carried out with the Statistical Package for the Social Sciences (SPSS) Version 15.0 for Windows. Demographic and clinical variables in eating disorder patients and healthy controls were compared using t-tests and one-way analyses of variance (ANOVAs). T-tests were used to compare BIS scores between eating disorder groups. Performance on the IGT was compared using repeated-measures ANOVA, with the net score per five blocks of 20 card selections as the repeated measures and group as between-group factor. Total IGT net scores between groups were also compared with one-way ANOVA. Effect sizes were calculated using Cohen's d, with $d=0.2$ regarded as a small effect, $d=0.5$ as a medium effect, and $d=0.8$ as a large effect (Cohen, 1998). Age, years of education, BMI and BDI scores were included in the analyses as covariates. Pearson correlations were used to evaluate the relation between IGT and demographic, and clinical variables. To assess the relation between IGT and impulsivity we used Pearson correlations in the whole sample and in each group separately. Finally, regression analyses were performed for a better understanding of these correlations, with the IGT total score as the dependent variable, and eating disorder group, BIS score, and clinical and demographic variables as independent variables.

Please cite this article as: Garrido, I., Subirá, S., Decision-making and impulsivity in eating disorder patients. Psychiatry Research (2012), http://dx.doi.org/10.1016/j.psychres.2012.10.004